Silver Isotope signature of the Sudbury Igneous Complex

A.M. DAVIS[1]*, A. G. TOMKINS[1], O. NEBEL[1]

[1] Monash University, Melbourne, Victoria, Australia
[1](*correspondense: alison.davis@monash.edu, andy.tomkins@monash.edu, oliver.nebel@monash.edu)

The popularity of Ag isotope studies has risen in recent years due to advances in the field of multiple-collector inductively coupled plasma mass spectrometry (MC-ICP-MS). However, the database is still very limited, with less than a dozen studies on terrestrial samples. The best estimation available for the bulk silicate earth (BSE) is $\varepsilon^{107}Ag = -2.2 \pm 0.7$ (2sd) relative to NIST SRM 978a as determined by Schönbächler *et al.* [1] based on a set of un-altered mantle derived rocks. However, no comprehensive determination has been made of the Ag-isotope signature of the Earth's crust. The main challenges associated with analysing Ag isotopes in crustal rocks is their typically low concentration of Ag (ppb level) and the difficulties associated with dissolving large volumes of silicates. This study aims to use native silver samples that formed through crystallisation the Sudbury Igneous Complex to produce an estimation of the Ag-isotope signature of the Earth's crust.

The Sudbury Igneous Complex in Canada is a melt sheet with an origional volume of $800km^3$ within what has been argued to be the Earth's largest preserved impact structure. The impact occurred at 1850Ma at the contact between the Archean orthogneisses of the Superior Province and the Proterozoic Huronian supracrustal rocks of the Southern Province. The Sudbury Igneous Complex hosts a series of world class Ni-Cu-PGE sulfide ore deposits which contain native silver. This study is analysing the Ag isotopic composition of native silver samples from four Ni-Cu-PGE deposits. Silver will be purified from samples prior to analysis. Initial measurements of NIST SRM 978a and in-house ICP solution have returned results with an analytical precision of ± 0.05 $\varepsilon^{107}Ag$ (2sd), an order of magnitude higher than previous studies [e.g. 2]. We suggest that if Ag isotope ratios are consistant between the four Sudbury deposits, that this result can be used as an estimation for the average signature of the target rocks, and by extension provides a reasonable estimate for the average Ag isotope signature of the Earth's crust.

[1] Schönbächler et al. (2010) *Science*, **328**(5980), 884-887. [2] Schönbächler et al. (2007) *Int. J. Mass Spec*. **261**, 183-191.